Engineering, Mechanical (ENME)

Courses

ENME 2410 Materials Science I (3 Credits)
Atomic structure, bonding and crystal structures in solids. Diffusion and crystal defects. Thermodynamics and phase equilibria in one-, two- and three-component systems, binary phase diagrams. Kinetics and phase transformations. Specific microstructure and mechanical properties of metals, glasses, ceramics, polymers and composites. Electrical conduction: energy levels and bands, charge carriers and insulators. Semiconductors of intrinsic and extrinsic types. Prerequisites: PHYS 1212, CHEM 1010, CHEM 1610, MATH 1953 or permission of instructor.

ENME 2421 Materials Science II (3 Credits)

ENME 2510 Statics with Lab (4 Credits)
Study of static force systems. Topics include resolution and composition of forces and moments, equilibrium of two-dimensional and three-dimensional force systems, shear and moments in beams, friction, and moments of inertia. Includes a laboratory component where students will engage in hands-on projects that apply loading equilibrium, design of structures, and stress/strain. Prerequisites: MATH 1952 and PHYS 1211.

ENME 2520 Dynamics I with Lab (4 Credits)

ENME 2530 Dynamics II (3 Credits)
Rotating reference frames, rigid body kinematics, rigid body kinetics, Euler’s Laws, inertia, energy and momentum, and three-dimensional motion. Cross listed with PHYS 2530. Prerequisites: ENME 2520 and MATH 2080.

ENME 2540 System Dynamics (3 Credits)
This course covers modeling, analysis, and control of single and multiple degree-of-freedom dynamical systems, including mechanical, electrical, thermal, fluid systems and their combinations (mixed systems). Basic concepts in system theory, such as state variables and stability concepts, will be introduced as well as bond graph notation and approach. Prerequisites: ENME 2710, ENME 2661, ENME 2520, ENGR 1572, ENEE 2012.

ENME 2541 Mechanics of Materials (3 Credits)
Normal and shear stress and strain; elasticity, mechanical properties of materials, principal stresses; torsion, beams, deflection of beams under loads, methods of superposition, failure theory, columns. Prerequisite: ENME 2510.

ENME 2561 Fluid Dynamics I (3 Credits)
Course series provides students with the basic skill levels required to solve fluid-mechanics and heat transfer problems. Topics include hydrostatics, dimensional analysis, incompressible and compressible flows, conduction, convection and radiation. Students explore a variety of solution techniques such as control volume, differential analysis, boundary layer analysis, finite differencing and resistance network analogies. Prerequisite: ENME 2520.

ENME 2661 Fluid Dynamics II/Heat Transfer I (3 Credits)
Course series provides students with the basic skills levels required to solve fluid-mechanics and heat transfer problems. Topics include hydrostatics, dimensional analysis, incompressible and compressible flows, conduction, convection and radiation. Students explore a variety of solution techniques such as control volume, differential analysis, boundary layer analysis, finite differencing and resistance network analogies. Prerequisite: ENME 2651.

ENME 2671 Heat Transfer II with Lab (4 Credits)
Course series provides students with the basic skill levels required to solve fluid-mechanics and heat transfer problems. Topics include hydrostatics, dimensional analysis, incompressible and compressible flows, conduction, convection and radiation. Students explore a variety of solution techniques such as control volume, differential analysis, boundary layer analysis, finite differencing and resistance network analogies. Prerequisite: ENME 2661.

ENME 2710 Engineering Thermodynamics I (3 Credits)

ENME 2720 Engineering Thermodynamics II (3 Credits)

ENME 2810 Mechanical Engineering Lab I (3 Credits)
Engineering experiments illustrating selected topics in heat transfer, fluid mechanics, solid mechanics, thermodynamics, measurement and control. Use of microcomputers in experimentation and control. This course encourages the development of laboratory experimentation skills, design skills and technical writing skills. Prerequisites: ENME 2671 and ENME 2530 or permission of instructor.
ENME 2820 Mechanical Engineering Lab II (3 Credits)
Engineering experiments illustrating selected topics in heat transfer, fluid mechanics, solid mechanics, thermodynamics, measurement and control. Use of microcomputers in experimentation and control. This course encourages the development of laboratory experimentation skills, design skills and technical writing skills. Prerequisite: ENME 2810 or permission of instructor.

ENME 2992 Directed Study (1-10 Credits)

ENME 3310 Computational Methods for Mechanics and Materials (4 Credits)
An introductory course for the general-purpose computational methods in advanced multiscale materials and mechanics. Students learn the fundamentals of the numerical methods used in mechanical and materials engineering. Cross listed with ENME 4310.

ENME 3400 Fatigue (4 Credits)
A detailed overview of fatigue. Topics include: stress life and strain life approaches, fracture mechanics, constant amplitude and spectrum loading, life prediction, fatigue at notches, microstructural effects, environmentally assisted fatigue, retardation and acceleration, multi-axial fatigue, design against fatigue, and reliability. Cross listed with ENME 4400.

ENME 3511 Machine Design (3 Credits)
Application of statics, dynamics, mechanics of materials and manufacturing processes to the design of machine elements and systems. Properties of materials and design criteria. Synthesis and analysis of a machine design project. Prerequisites: ENME 2520, ENME 2541.

ENME 3545 Mechanisms (4 Credits)
Synthesis, analysis and use of mechanisms. Mechanisms studied include cams, gears and planar linkages, with an emphasis on planar linkages. Prerequisites: ENME 2530 and COMP 1572.

ENME 3651 Computational Fluid Dynamics (4 Credits)
This course introduces principles and applications of computational methods in fluid flow and topics chosen from heat transfer, mass transfer or two phase flow. The conservation equations, their discretations and solutions, are presented. Convergence and validity of solutions along with computational efficiency are explored. Students learn to apply these techniques using the latest software packages. Prerequisite: ENME 2671 or instructor approval.

ENME 3661 Mechanical Energy Systems Engineering (4 Credits)
This course covers energy systems engineering analysis from a mechanical and materials engineering perspective. This course covers energy production from traditional energy systems that use fossil fuel combustion such as internal combustion engines, coal-fired plants, and natural gas turbines, to nuclear energy and renewable energy methods such as wind, solar, hydraulic, and geothermal. Lastly, the course will survey emerging technologies for future (21st century) energy systems. Students should have taken a minimum Thermodynamics, Dynamics, and Fluid Dynamics courses. Prerequisites: ENME 2720, ENME 2510, ENME 2651.

ENME 3720 Introduction to Aerospace Engineering (4 Credits)
This course provides and introduction to aerospace engineering analysis and design. In the atmospheric domain, the basics of aerodynamics are covered, followed by flight mechanics. The approach is from a practical perspective in which analysis and design are intertwined. Students should have taken at a minimum Thermodynamics and Dynamics courses. Prerequisites: ENME 2710 and ENME 2510 or Graduate standing.

ENME 3820 Topics Mechanical Engineering (1-5 Credits)
Mechanical engineering topics as announced. May be taken more than once. Prerequisite: vary with offering.

ENME 3991 Independent Study (1-5 Credits)
Topics in mechanical engineering investigated under faculty supervision. May be taken more than once. Students must obtain and complete an Independent Study form from the Office of the Registrar. Prerequisite: permission of instructor.

ENME 3992 Directed Study (1-10 Credits)

ENME 3995 Independent Research (1-10 Credits)